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Environmental Performance Rating and Disclosure

China's Green-Watch Program

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Abstract

This paper describes a new incentive-based pollution control program in China in which the environmental performance of firms is rated and reported to the public. Firms are rated from best to worst using five colors—green, blue, yellow, red, and black—and the ratings are disseminated to the public through the media. The impact has been substantial, suggesting that public disclosure provides a significant incentive for firms to improve their environmental performance.

The paper focuses on the experience of the first two disclosure programs, in Zhenjiang, Jiangsu Province and Hohhot, Inner Mongolia. Successful implementation of these programs at two very different levels of economic and institutional development suggests that public disclosure should be feasible in most of China. The Zhenjiang and Hohhot experiences have also shown that performance disclosure can significantly reduce pollution, even in settings where environmental nongovernmental organizations are not very active and there is no formal channel for public participation in environmental regulation.

This paper—a product of Infrastructure and Environment, Development Research Group—is part of a larger effort in the group to develop more cost-effective approaches to the regulation of externalities. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Yasmin D'Souza, room MC2-622, telephone 202-473-1449, fax 202-522-3230, email address ydsouza@worldbank.org. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The authors may be contacted at hwang1@worldbank.org, jbi@worldbank.org, or dwheeler1@worldbank.org. September 2002. (28 pages)

Environmental Performance Rating and Disclosure:

China's GreenWatch Program

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1. Introduction

Public disclosure of firms' environmental performance has been characterized as the "third wave" of environmental regulation, after command-and-control and market-based approaches (Tietenberg, 1998). Its growing popularity stems from initial evidence that disclosure has reduced emissions in North America and Southeast Asia,[2] as well as the perception that it is a low-cost regulatory option because it does not require formal enforcement procedures. China's State Environmental Protection Agency (SEPA) has become interested in public disclosure because China's pollution problem remains severe, despite long-standing attempts to control it with traditional regulatory instruments.

Chinese regulators have also been influenced by the rapid spread of pollution disclosure systems to other Asian countries after pilot programs were initiated by Indonesia and Philippines in 1995 (World Bank, 1999). As a result, China has begun pilot experiments with "third wave" regulation. Since late 1998, supported by the World Bank's InfoDev Program, the authors have been working with China's State Environmental Protection Administration (SEPA) to establish GreenWatch, a public disclosure program for polluters. Adapted from Indonesia's PROPER, the GreenWatch program rates firms' environmental performance from best to worst in five colors – green, blue, yellow, red and black. The ratings are disseminated to the public through the media. Two municipal-level pilot GreenWatch programs have been implemented, in Zhenjiang, Jiangsu Province, and Hohhot, Inner Mongolia. Reaction to the pilot programs has been positive, and Jiangsu Province has decided to promote province-wide

[2] For evidence on toxic emissions reduction in the US, see Konar and Cohen (1996) and Tietenberg and Wheeler (2001). The impact of disclosure on two water pollutants (biochemical oxygen demand and suspended solids) has been analyzed for Canada (Foulon, Lanoie and Laplante, 2000), Indonesia (Afsah and Vincent, 1997) and Philippines (World Bank, 1999).

implementation of GreenWatch. SEPA currently plans to launch pilot programs in other areas, in preparation for nationwide implementation of public disclosure.

This paper describes China's GreenWatch program, its results to date, and the implications for national adoption of public disclosure. In Section 2, we discuss the role of disclosure in China's approach to environmental management. Sections 3 and 4 describe the Zhenjiang and Hohhot programs, respectively. Section 5 summarizes the lessons learned to date from the GreenWatch experience, and Section 6 provides further discussion of the use of information strategies for pollution management.

2. Industrial Pollution Control in China

2.1 China's Industrial Pollution Problem

China's industrial growth has been extremely rapid during the period of economic reform. In the 1990's, the output of the country's millions of industrial enterprises has increased by more than 15% annually. While industry has helped lift tens of millions of people out of poverty, its polluting emissions have also produced serious environmental damage. Recent research (Bolt, et al., 2001) suggests that China's air pollution problem is the worst in the world. With over 300,000 premature deaths per year, China accounts for over 40% of the total for the developing world -- more than twice the number for South Asia, which has a comparable population. Similar percentages characterize other measures of health damage.

Chinese industry is a primary source of this problem. China's State Environmental Protection Administration (SEPA) estimates that in 2000, industry accounted for about 40% of the nation's water pollution, and about 80% of its air pollution. For this reason,

SEPA has continuously declared control of industrial pollution to be one of the top priorities for Chinese regulators.

During the past decade, conventional regulation has probably saved millions of lives by helping hold the growth rate of total emissions well below the growth rate of industry. However, the continuing severity of pollution has led the Chinese government to experiment with public pollution disclosure as a possible complement to existing measures.

2.2 The Role of Public Disclosure in Chinese Industrial Pollution Control

Traditional command-and-control approaches and economic instruments have been widely employed in Chinese environmental management. However, the enforcement of those policy instruments has generally been weak (World Bank, 2001). Previous experience in the US, Indonesia and elsewhere has demonstrated that public disclosure of environmental performance can promote regulatory compliance for several reasons. First, disclosure provides an additional incentive for improved performance because many companies value their public image. Second, ratings provide a valuable environmental management tool for enterprises, which in many cases have never undertaken a comprehensive assessment of their environmental performance.

Third, public disclosure can strengthen the regulatory institutions themselves. In most cases, Chinese regulators already have the information needed for public rating of environmental performance. Many agencies receive regular, facility-level reports on emissions, pollution control investments, field inspections and accidents. However, public disclosure can significantly raise the ante by pressuring regulators toward more accurate and timely record-keeping. With its credibility on the line in a disclosure

program, a regulatory agency has a strong incentive to maintain high internal standards. This is particularly true for emissions monitoring, which provides the foundation for an environmental performance rating system.

Fourth, disclosure encourages public participation in environmental regulation. Insufficient access to environmental information is a major reason for the weakness of public participation in China's environmental management (Wang et al, 2002). Public performance ratings make it much easier for concerned citizens to identify serious polluters and pressure them to improve their performance.

Finally, the experiences of Hohhot Municipality and Zhenjiang City suggest that disclosure also changes the balance of environmental initiative between polluters and regulators. Prior to disclosure in these areas, local enterprises generally resisted regulators' attempts to monitor them more closely. After disclosure attracted widespread publicity through the news media, however, companies perceived an impact on their public image and the market image of their products. Enterprises that improved their performance immediately requested new monitoring reports, so that their public ratings could be improved as well. Enterprises with poor ratings shifted from passive resistance to active solicitation of inspections, as a means of improving their ratings. At the same time, enterprises with good ratings felt continued pressure to maintain their environmental performance, to avoid complaints from the public about backsliding.

2.3 Support for Disclosure in China

Although public ratings are relatively new in China, there is ample legal, social, technical and institutional support for disclosure.

Legal support

Chinese law provides ample precedent for the use of public disclosure to control pollution. For example, the Constitution of the PRC states that, "*all rights in the PRC belong to the people. The people manage state affairs, economic and cultural affairs, and social affairs by various means in accordance with the law.*" For regulation, this principle accords the people the right to supervise the environmental work of state authorities, as well as discipline them for illegal behavior. In the Environmental Protection Law of the PRC, Article 6 prescribes that, "*all units and individuals have the obligation to protect the environment, and have the right to impeach and accuse units and individuals that pollute and damage the environment;*" Article 11 prescribes that, *"the competent administrative department of environmental protection under the State Council establishes monitoring systems, constitutes monitoring criteria, organizes monitoring networks with related departments, and strengthens management of environmental monitoring. The competent administrative departments of environmental protection under the State Council, provincial and municipal governments shall regularly publicize environmental status reports."* Similar provisions appear in China's Air Pollution Prevention and Control Law, Water Pollution Prevention and Control Law, Marine Environment Protection Law, and Environmental Noise Prevention and Control Law.

Information disclosure and pubic participation also feature prominently in government declarations, as well as international conventions signed by China. For example, in the Rio Declaration, signed during the United Nations Conference on Environment and Development in 1992, the 10th Principle prescribes that individuals

should have access to government information about environmental hazards in their communities, and should be able to participate in decisions about regulation of these hazards. Another example is provided by the Chinese State Council's Decision on Several Issues Related to Environmental Protection, which encourages public participation in environmental regulation and defines an important role for the news media in publicizing actions that damage the environment.

Social support

In the information age, public opinion has proven to be a powerful force in every society. This force is best mobilized by the major print and broadcast media, since their content is easily understood by the public. In 1997, the Chinese Central Television Program disclosed non-compliance by some polluters in the Huai River Basin. As a result, both the polluters and the local authorities came under great pressure to improve their performance. Currently, environmental protection ranks high among the concerns of urban residents. In 1999, the Social Survey Institute of China (SSIC) surveyed the public-agenda priorities of households in Beijing, Shanghai, Tianjin, Guangzhou, Chongqing, Wuhan and other cities. The survey covered issues related to corruption, law enforcement, inflation, equity and environmental protection. Corruption was the primary concern, followed by environmental protection, with 66% of households rating the latter as very important. Given this concern, social support for public disclosure of environmental information should be strong

Technical support

Accurate information provides the essential foundation for public ratings of environmental performance. Accuracy, in turn, depends on the quality of information-gathering technology, and on the reliability of record-keeping by the authorities. After establishment of the national task force on environmental monitoring 20 years ago, China has been making significant progress on this front. At present, there are over 4,800 environmental monitoring units in China, employing over 60,000 people. The current system uses standardized monitoring equipment, deployed to cover both the ambient environment and polluting emissions. It is overseen by over 3,600 environmental supervision units, with a working staff of over 26,000 people.

Institutional precedents

Although comprehensive public disclosure is new in China, the government has previously recognized superior environmental performance. Since 1989, SEPA and its predecessor (NEPA) have maintained a list of enterprises with excellent environmental ratings. Enterprises are listed on the recommendation of provincial environmental protection bureaus, after vetting by the national Panel of Evaluation and Assessment whose representatives come from the national agency, the State Environmental Monitoring Station of China, and other ministries. By 1997, this assessment had been conducted 6 times, and 500 enterprises had been awarded the title, 'Nationwide Advanced Enterprise on Environmental Protection.' Over time, numerous enterprises have been removed from the list for failure to maintain standards consistent with the award. However, over 180 enterprises have retained their excellent ratings.

Potential barriers

The most important resistance to environmental performance disclosure programs in China may come from local governments. Chinese leaders in the central government have strongly supported the public disclosure strategy. In 2001, Premier Zhu Rongji stated explicitly that no environmental information should be kept secret. SEPA's minister, Mr. Xie Zhenhua, has also expressed strong support for environmental performance disclosure. However, some local governments have resisted on the grounds that disclosure may threaten local employment by reducing polluters' profits. In addition, some may be concerned about the additional administrative costs imposed by disclosure programs. Finally, local authorities may simply worry about whether they can implement such programs effectively, and how disclosure may affect relations between local companies and communities. Under these circumstances, financial support from provincial or national authorities may be needed to underwrite the startup costs for local disclosure programs.

3. Public Disclosure in Zhenjiang

3.1 Program Design

Zhenjiang is located in Jiangsu, a relatively high-income province whose GDP per capita was US$2,300 in 1999. Zhenjiang's Environmental Information Disclosure Program reflects design principles that have proven successful in previous disclosure programs in Indonesia and the Philippines. First, the performance rating system is simple, so that its implications can be easily understood and accepted by firms and the public.

Second, it identifies both superior and inferior performance. Finally, the ratings are color-coded for easy communication by the broadcast and print media.

The system divides industrial firms' environmental performance into five symmetric rating categories, with two (black, red) denoting inferior performance; one (yellow) denoting compliance with minimum emission regulations but failure to comply with stricter requirements; and two ratings (blue, green) denoting superior performance. Because it recognizes three performance levels for firms that comply with basic emission requirements, the system provides incentives for continuous improvement. Even for non-compliant firms, the system rewards efforts to improve by recognizing two levels of performance.

3.2 Performance Ratings

The program's color-coded ratings are generated by a detailed accounting of environmental performance, whose major elements are summarized in Table 1. The ratings system draws on four principle sources of information: reports on industrial firms' polluting emissions; inspection reports on their environmental management; records of public complaints, regulatory actions and penalties; and surveys that record characteristics of the firms that are relevant for rating environmental performance.

Compliance with regulations

The rating system incorporates six dimensions of environmental pollution: water, air, noise, solid waste, electromagnetic radiation, and radioactive contamination. It includes emissions information for 13 regulated air and water pollutants: chemical oxygen demand, suspended solids, oil, volatile hydroxybenzene, chromium, cyanide, lead,

arsenic, mercury, cadmium, flue dust, industrial dust and sulfur dioxide. Pollutant discharges are rated by total quantity and concentration. Solid wastes are rated in three dimensions: production, disposal, and recycling.

Management behavior

This element involves a detailed accounting of behavior in several dimensions. Environmental management effort is graded with respect to: timely payment of pollution discharge fees; implementation of the national Pollutant Discharge Reporting and Registering Program, the Standardized Waste Management Measure, and the Three Synchronizations Program[3]; and variables related to internal environmental monitoring, staff training, and internal document preparation. In addition, the rating system considers the firm's efficiency of resource use; its technological level (e.g., implementation of the national Cleaner Production Audit Program); and the quality of its environmental management system.

Social impact

Indicators in this category include the firm's record with respect to public complaints, pollution accidents, illegal pollution, and administrative penalties.

3.3 Program Implementation

Ratings construction

The Zhenjiang rating system uses a series of yes/no questions to translate its multidimensional performance indicators into 5 color codes. Figure 1 shows how this is

[3] This program's purpose is to ensure that new construction projects include pollution abatement facilities that meet state emission and effluent standards. Under the program, a new industrial enterprise or one that wishes to expand or change its production process must register its plans with the local environmental protection bureau and design (first synchronization), construct (second synchronization), and begin to

done, while Table 1 provides a detailed accounting by category. Initially-selected firms were enterprises classified as large on the basis of plant size, production value and reported pollution discharge load. Subsequently, the program has expanded to cover smaller firms. The Zhenjiang Environmental Protection Burean (EPB) uses its own records to develop information on the firms' polluting emissions, management behavior and social impacts.

Disclosure process

A distinctive feature of the rating-disclosure process is its "Inform-Respond-Check-Disclose" reciprocal mechanism, in which industrial firms can exchange comments about their ratings with the EPB prior to disclosure. By reconsidering and rechecking at the firms' request, the EPB encourages (but is not required to gain) their acceptance of the final ratings, as well as promoting a more detailed environmental accounting by the firms themselves. After setting the ratings, the EPB sends them to the program's Steering Board for final checking and ratification prior to public disclosure. The Steering Board is led by the deputy mayor in charge of environmental protection, and its members come from the EPB and other relevant administrative departments and institutions. Its main responsibility is to ratify the ratings and transmit them to the firms and the news media. To ensure accurate press reports, the EPB invites reporters to a detailed presentation of the program, including an explanation of the rating system and a demonstration of the computer program that is used for ratings development.

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operate (third synchronization) pollution control facilities simultaneously with the principal part of the enterprise's production activities.

Pilot ratings

The pilot program began in June, 1999, with selection and rating of 101 firms drawn from several industry sectors. During the pilot phase, the Zhenjiang EPB regularly reported its progress to the municipal government and the media. The firms were informed of their pilot ratings in 1998. Ten firms were de-listed during this initial period because of data quality problems, leaving 91 firms for disclosure. The latter accounted for 95% of measured pollution emissions in Zhenjiang, as well as 65% of the city's economic output.

The pilot ratings, displayed in Figure 2a, indicated widespread deficiencies, with 69% of the firms rated as Yellow, Red or Black. However, 31% demonstrated superior performance even in the pilot disclosure period, and a few earned the highest (Green) rating.

Public disclosure

In May, 2000, the Zhenjiang municipal government officially recognized the program and issued a formal "Notice of Implementation of the Environmental Information Program in Zhenjiang City." The municipal government also presided over the first disclosure at a press conference on July 26th, 2000. Other participants included representatives of all 91 rated firms, the Program Steering Board, and deputies from the Jiangsu Province EPB and the EPBs of other cities in Jiangsu. The Steering Board publicly released the ratings, and the firms' representatives accepted and commented on them. For several days after the press conference, local newspapers and TV stations continually reported the event, the results of the first disclosure, and promises by rated firms to improve their environmental performance.

The results show that many firms chose to improve their environmental performance during the one-year grace period between pilot disclosure and public disclosure. The number of superior performers doubled, from 31% of the rated firms to 62% (Figure 2b). The pressure from public disclosure clearly reinforced another program, "One Control and Double Attainments (OCDA)", that was implemented in Zhenjiang during the period 1998-2000. The objectives of the latter program were full compliance with local and national concentration-based emission standards by enterprises in Zhenjiang City.

Industrial environmental performance in Zhenjiang improved significantly after combined implementation of OCDA and public disclosure. As a result, the disclosure program Steering Board announced its support for annual disclosures.

4. Public Disclosure in Hohhot

4.1 Program Design

Hohhot is located in Inner Mongolia Autonomous District, a northern, relatively poor region of China whose GDP per capita was US$1,100 in 1999. Hohhot's regulatory capacity is less-developed than Zhenjiang's, so its disclosure program is designed for cost-effective implementation in a relatively weak institutional setting. In Hohhot, the program focuses on firms that meet three criteria: major contributions to local pollution; management with some independence of action; and possible susceptibility to public pressure for improvement. To maximize the incentive effects of disclosure, the ratings standards are set to reveal a broad distribution of relative environmental performance. The three design principles employed in Zhenjiang are also followed in Hohhot.

Performance ratings

Hohhot uses the same color ratings as Zhenjiang, ranging from green (best performance) through blue, yellow and red, to black (worst performance). Specific grading criteria are summarized in Figure 3. The performance ratings cover only discharges and emissions of three major pollutants (COD for water; TSP and SO2 for air), along with the quality of plants' environmental management. Figure 3 shows that the ratings are much simpler in Hohhot than in Zhenjiang.

Ratings construction

In Hohhot, development of the ratings system coincided with meetings to build support for the concept from government agencies, the general public and the affected industry sectors. The assessment work utilized data collected by the Environmental Supervision Station of Hohhot City for the year 1999. Ratings were developed during the period December, 1998 to December, 1999, and several review meetings were conducted prior to official disclosure in March, 2000. As in Zhenjiang, a pilot ratings exercise was undertaken in consultation with affected enterprises before the ratings were disclosed to the public.

4.2 Program Implementation

On March 24, 2000, the Hohhot City government convened a news conference to disclose the environmental performance ratings to the public. Participants included the program development team, other government agencies, representatives from China's State Environmental Protection Administration (SEPA), and representatives from the 56 industrial enterprises and 51 other institutions that were rated. Major central and regional

media also attended. Broadcast news programs featured stories about the disclosure for several days after the event.

As in the case of Zhenjiang, the evidence suggests that many polluters responded to public ratings of their environmental performance. After disclosure, large, persistent polluters such as the Hohhot Power Plant and the Hohhot Cement Mill repeatedly sent deputies to the Hohhot EPB to discuss how they could improve their ratings and made pollution abatement investments. As Figure 4 shows, the 56 industrial enterprises rated in Hohhot greatly improved their environmental performance during the period 1999 - 2000. Enterprises rated Good or better increased from 24% to 62%, and enterprises in the worst (Black) category decreased from 11% to 5%. As in Zhenjiang, this improvement undoubtedly reflected pressure from both the OCDA and public disclosure programs.

5. Lessons Learned

Experiments with environmental performance disclosure continue to expand in China. After observing the results in Hohhot and Zhenjiang, the EPB of Jiangsu Province decided to implement disclosure in its 13 municipalities in 2001. As of June, 2002, about 2,500 firms have been included in the GreenWatch program.

The evidence to date suggests that public disclosure of environmental performance can be an effective new component of China's system for regulating pollution. Implementation should be feasible in most areas, because technical and design issues are not overly complex, and supporting expertise is available in almost every city of China. With some training and consulting services, there should be no technical barrier to

implementation of disclosure in the entire country. The case studies of Zhenjiang and Hohhot suggest that the costs of design and implementation are not high in China, since most of the necessary information already exists in the records of local Environmental Protection Bureaus. However, it might well be appropriate for China's highly-varied regions to institute ratings criteria and procedures that reflect their special circumstances.

The Zhenjiang and Hohhot experiences have also suggested a number of important lessons for successful implementation of disclosure in China. The first is that government support and involvement are critical. Only government can provide detailed and credible plant-level information for the public in China. The case studies also suggest that involvement of local government leaders is particularly important. Some municipal EPBs at this stage are not politically strong enough to disclose plant-level environmental performance without explicit support from the mayors or upper-level government agencies. In the two case studies, city mayors supported the program after lobbying from the local EPB and expressions of support from the central government.

Timing is also very important in this context. In both cities, the experience of pilot disclosure suggests that many enterprises will improve their performance prior to public disclosure, if they are informed of their ratings and given sufficient time to invest in pollution control. For public disclosure itself, intervals of one year between public ratings may strike a reasonable balance between the loss of public pressure over longer intervals and the higher cost of developing new ratings over shorter intervals.

Public disclosure clearly places unprecedented demands on environmental agencies' management information systems. Although there are substantial startup costs, the agencies realize large long-run gains from much more flexible, current and well-

documented information systems. In this dimension, improved information management with public disclosure also yields substantial benefits for the implementation of conventional regulation.

The Zhenjiang and Hohhot experiences highlight the importance of several program design and implementation issues:

1. Selection of media and pollutants: This depends on the scope of local pollution problems, as well as the capacity of the implementing agency. Responding largely to the latter concern, Hohhot could only consider major water and air pollutants in the initial phase of its program. By contrast, Zhenjiang's institutional capacity and information base enabled it to include a large number of pollutants.

2. Selection of polluters: Whether program participation is mandatory or voluntary, it should be governed by clear criteria that are consistent with the relevant legal statutes. Thus far, programs have begun with mandatory participation of large polluters, and then expanded to cover smaller pollution sources.

3. Rating strategy: Ratings should be clear and easily communicated to the public, in order to mobilize continuous pressure on firms to improve their performance. The ratings parameters should be as objective as possible, and it is generally best to avoid constructing indices that assign varying weights to different parameters. The best and worst performance ratings should reflect commonly-understood principles. In both Zhenjiang and Hohhot, the worst rating has been assigned to firms whose emissions are both seriously non-compliant and very damaging to the environment. At the other end of the spectrum, the best rating goes to world-class performers that have earned ISO-14000 status.

4. Disclosure strategy: Key decisions in this context reflect technical, legal, social and political considerations. Characteristic problems include the choice of colors, the sequencing of pilot and public disclosure, how frequently to disclose, appropriate media strategy, etc.

5. Data quality: The credibility of public disclosure depends on the credibility of the information that is used for ratings construction. Therefore, an institutional decision to adopt disclosure is also a commitment to rigorous standards for collection, verification, storage and retrieval of information about polluters. For a disclosure program to be continuously effective, accurate data recording, processing and presentation are crucial.

6. Mobilizing stakeholder support: Strong disclosure programs require effective identification and mobilization of supporting constituencies. The underlying political and social factors are highly specific to each region.

7. Institutional arrangements: Differing local circumstances may dictate differing roles for governmental and non-governmental institutions in data collection, ratings construction, certification of accuracy, and pubic dissemination.

6. Discussion and Conclusions

Recent research has shown that public disclosure provides a promising complement to conventional regulation through several channels. The first is "informal regulation," or community pressure on polluters. Even low-income communities have proven willing and able to penalize polluters when information about their emissions is available. Abundant evidence from Asia and Latin America shows that neighboring communities can strongly influence factories' environmental performance (e.g., Pargal and Wheeler,

1996). Where formal regulators are present, communities use the political process to influence the strictness of enforcement. Where regulators are absent or ineffective, nongovernmental organizations and community groups apply pressure through a variety of channels, including religious institutions, social organizations, citizens' movements, and politicians. Although the channels vary from region to region, the pattern everywhere is similar: Factories negotiate directly with local actors in response to threats of social, political or physical sanctions if they fail to compensate the community or to reduce emissions.

Well-informed market agents can also play an important role in creating pressures for environmental protection. Bankers may refuse to extend credit because they are worried about environmental liability; consumers may avoid the products of firms that are known to be heavy polluters. The evidence suggests that multinational firms are important players in this context. These firms operate under close scrutiny from consumers and environmental organizations in the high-income economies. Investors also appear to play an important role in encouraging clean production. Heavy emissions may signal that a firm's production techniques are inefficient. Investors also weigh potential financial losses from regulatory penalties and liability settlements. Numerous studies suggest that stock markets in both developed and developing countries react significantly to environmental news (Lanoie and Laplante, 1994; Hamilton, 1995; Lanoie et al., 1997; Dasgupta and Wheeler, 1997).

During the past decade, a number of regulatory initiatives have attempted to use public information to reduce pollution. In many cases, such programs have focused on toxic pollutants that are not covered by conventional regulation. Examples include the

US Toxic Release Inventory; Canada's National Pollutant Release Inventory; the UK's Pollutant Inventory; Australia's National Pollutant Inventory (Tietenberg and Wheeler, 2001); and UN-sponsored Pollutant Release and Transfer Registers in Mexico, Egypt and the Czech Republic. Recently, the public disclosure approach has also been applied to water pollutants in Canada, Indonesia, Philippines, India and Vietnam.

China's GreenWatch program, which reflects the pilot program in Zhenjiang, represents the most ambitious approach to date. No longer a pilot exercise, the program is unique in breadth, covering all major air, water and toxic pollutants. It rates the environmental performance of approximately 2,500 polluting enterprises in 13 municipalities of Jiangsu Province. Evidence on results suggests that GreenWatch is a cost-effective complement to conventional regulation, and the successful experience of Hohhot indicates that implementation is feasible in less-developed regions of China. At present, the most pressing requirement for wider implementation is startup financing to overcome local inertia and administrative conservatism in some areas. On the basis of currently-available evidence, we believe that extension of GreenWatch to the whole of China would yield strong improvements in environmental performance and a very significant reduction in environmental damage from pollution.

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Figure 1

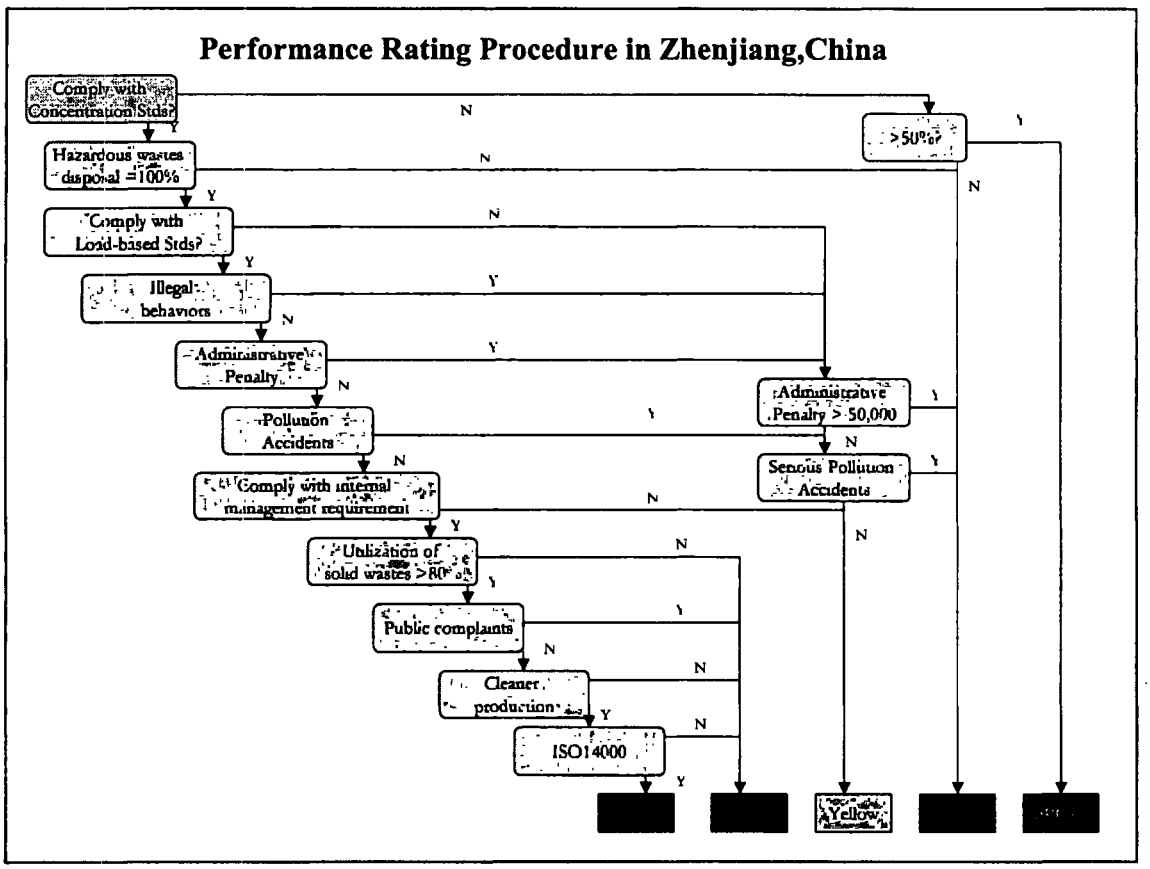
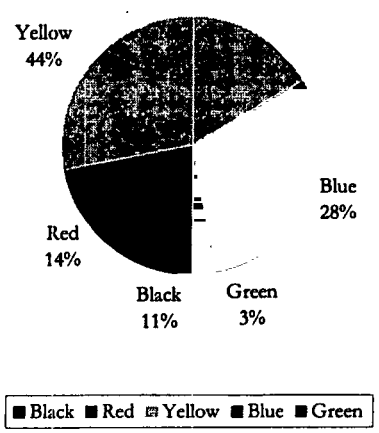


Figure 2: Performance Rating Results in Zhenjiang

A. Pilot Internal Disclosure in June 1999
(1998 data)



B. Formal Disclosure in July 2000
(1999 data)

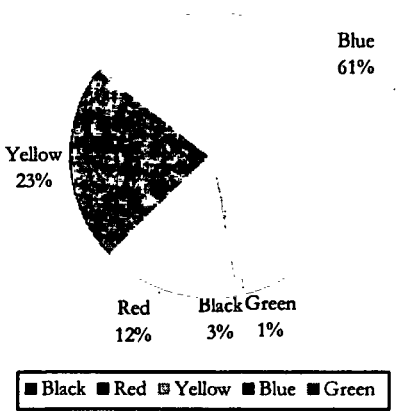


Table 1: Performance Indicators Employed in Zhenjiang

Indicator	Explanation
1 Discharge meeting the concentration standards	For each outlet, either (a) more than 80% of the pollutants meet discharge standards or (b) on average, the concentrations of the main pollutants meet the discharge standards. The disposal rate for hazardous solid waste is 100%.
2 Frequently failing to meet the standard	More than 50% of the pollutants fail to meet standards.
3 Discharge meeting the load-based standards	(1) For firms holding a discharge permit, pollution discharge within the allowed limit; (2) For other firms, conformity with requirement 1 above ("discharge meeting the standard").
4 Illegal pollution	One or more instances of illegal pollution.
5 Pollution accidents	Level 1: One or more pollution accidents, each of which imposes economic losses between RMB 1,000 yuan and RMB 10,000 yuan. Level 2 (any of the following): (1) One pollution accident that imposes an economic loss between RMB 10,000 yuan and RMB 50,000 yuan; (2) Poisoning of employees ; (3) Pollution-induced conflict between the factory and the neighboring community; (4) Some environmental damage. Level 3 (any of the following): (1) One pollution accident that imposes an economic loss between RMB 50,000 yuan and RMB 100,000 yuan; (2) Radiation damage to employees; crippling of employees; (3) Poisoning of neighboring residents (4) Serious impact on social stability (5) Serious damage to the environment Level 4: One pollution accident that imposes an economic loss of RMB 100,000 yuan or more.
6 Timely payment of discharge fee	For eight months of the year, the discharge fee is paid within the stipulated twenty-day period. For the rest of the year, the fee is paid within two months.
7 Discharge reporting and registering	Regular reporting and registering for all plants; monthly emissions reports by firms holding pollutant discharge permits.
8 Outlet control standardization	Designated emissions outlets should be visible, reasonably configured, and convenient for monitoring.

9 Implementation of the Three Synchronizations and the stipulated procedures for construction projects	(1) Timely completion of the environmental protection pre-audit; (2) Ratification of the plant's EIA within the stipulated period; (3) Full Implementation of the "Management Measures for Environmental Protection of Construction Projects."
10. Environmental management	Important criteria: (1) Management structure; (2) Number of environmental protection personnel; (3) Implementation of systems and regulations such as the Post Responsibility System for Environmental Protection; System for the Operation and Management of Environmental Protection Facilities; System of Reporting Environmental Performance; and System for Management of Environmental Protection Documents.
11 Proper disposition of solid wastes	100% residual solid waste disposal and a solid-waste comprehensive utilization factor over 80%.
12 Public complaints	Validated complaints about pollution that has significant environmental impact.
13 Cleaner production	Completion of a clean production audit that meets advanced international and domestic standards.
14 ISO14000	ISO 14000 certificate awarded after passage of the qualification test.

Figure 3

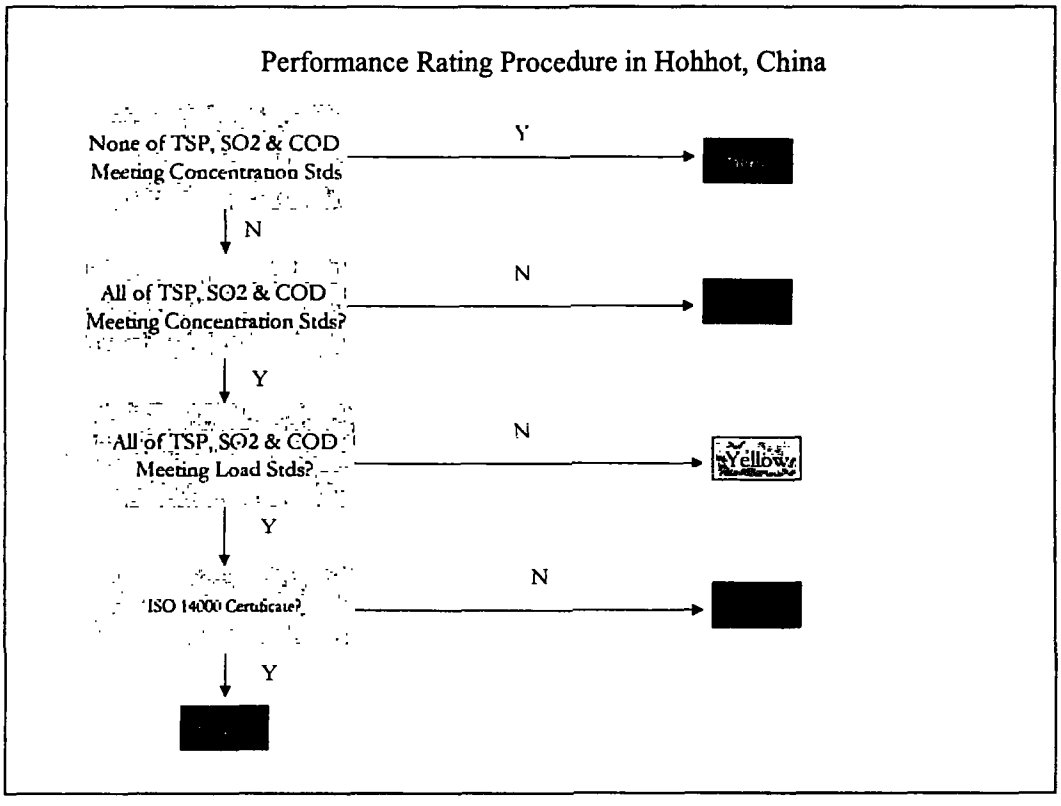
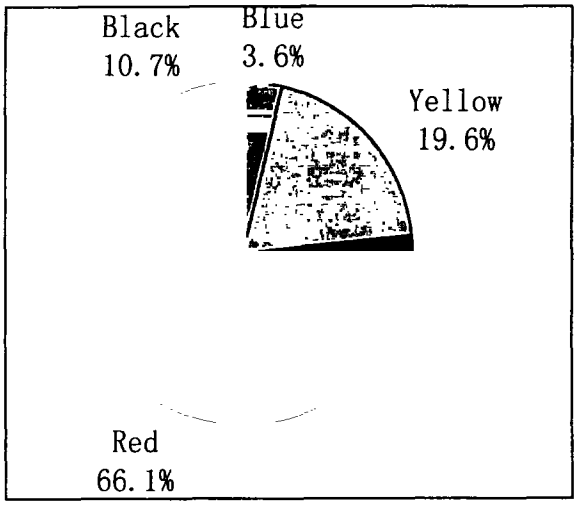


Figure 4: Performance Rating Results in Hohhot



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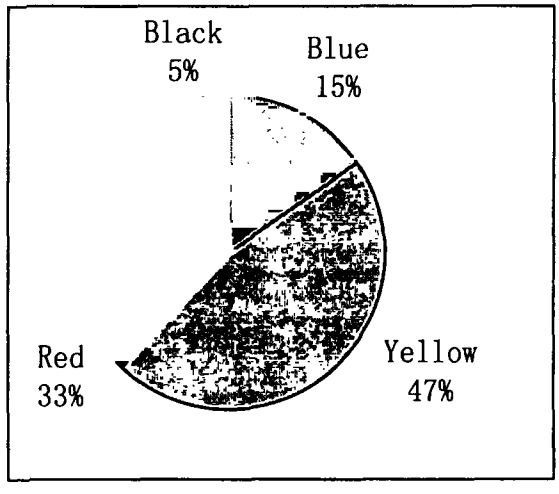

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